M103 HEAVY TANK 1950–74

KENNETH W. ESTES ILLUSTRATED BY RICHARD CHASEMORE

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NEW VANGUARD 197

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M103 HEAVY TANK 1950–74

INTRODUCTION

As the clash of the Allied and German armies on the Western Front reached new levels of fury in 1944, Brigadier General Gladeon M. Barnes, head of the US Army's Ordnance Technical Division, found new energy. For several years, he had advocated heavier tanks and more powerful tank cannon for the Army Ground Forces, but the latter had steadfastly refused to consider alternatives to the 35-ton M4 series medium tanks and their handy all-purpose 75mm tank cannon. In the aftermath of the Normandy landings that June, Barnes had been proven correct, as first British and then American tank troops fought the improved Kingtiger heavy tank and many more of the new 45-ton Panther tank, now seen equipping the German Panzer divisions as their new standard medium tank, vice a rumored specialized heavy tank equipping a few battalions. Thanks to Barnes' efforts, new M4 mediums armed with more powerful 76mm high velocity cannon already stood in the hundreds nearby in England, ready for issue. The 90mm tank cannon was en route to France in the turret of the M36 tank destroyer, and in a few more months, the first M26 heavy tanks with their 90mm cannon would begin to arrive.

Flushed with such success, and now meeting far less opposition to his ideas from Army Ground Forces, Barnes began pushing for several tank programs that would outclass the latest German heavies. In August, he pushed for rapid approval for the T29 and T30 heavy tanks, armed with new 105mm and 155mm cannon in well-armored turrets, weighing in at over 70 tons. Barnes wanted these and other new developments ready and in production in case the war lasted another year and a half. The Ordnance Department approved the construction of pilot vehicles for each design in September.

The Army Ground Forces staff rebelled at the notion that tank crewmen could handle the 95lb 155mm projectiles with a 40lb propellant casing within the confines of a turret. Why not instead convert the successful 120mm antiaircraft gun to tank use? Barnes continued pushing T30 into production, but also obliged the users with yet another heavy tank, designated T34, to be armed with the 120mm gun, and accelerated it by using two of his T30 pilot tanks for its testing. As the battle for Germany surged in the spring of 1945, Barnes obtained limited production orders for almost 1,200 T29s for the armored divisions as well as over 500 T30s to equip seven special tank battalions. The collapse of Germany changed

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nothing in the production orders, and the T29 heavy tank was slated for use in the invasion of Japan. However, the announcement of Japan's surrender brought these and other programs to a screeching halt. The US Army quickly terminated most production orders, and General Barnes' pilot heavy tanks became a collection of oversized testbeds for guns, engines, and ancillary equipment.

The T34 heavy tank prototype of 1946, last and most balanced of the projects developed by Army Ordnance at the end of World War II. Its powerful 120mm modified antiaircraft gun was passed to the pilot T43 tank as the T122, along with the torsion bar suspension, Continental AV-1790 engine and CD-850 transmission. (US Army)

As the demobilization of the forces and their military industrial bases ensued worldwide in the aftermath of World War II, the victorious powers took stock of their wartime military inventories and quite naturally found much of it dated and worn out. In the case of the US Army, it quickly declared its entire tank force obsolete with the exception of the new production M26 and the late production M4A3 mediums that had been armed with the 76mm gun and fitted with "wet stowage" of ammunition. In May 1946, the Army reclassified its tanks by increased weight classifications, reducing the M26 to the medium tank category.

But the Army was not alone in this situation. In March 1946, Brigadier General O. P. Smith, Commandant Marine Corps Schools, wrote the commandant of the Marine Corps of the dismal tale:

> In general, the tanks with which the Marine Divisions ended the war are now definitely obsolete. The tank for the future must be capable of withstanding greater punishment, be more mobile, and have improved hitting power. The present tanks are too slow and too vulnerable to antitank weapons.

Smith's key man in this assessment was the officer who had commanded his division's 1st Tank Battalion at Peleliu. There, both officers had witnessed the surprise counterattack of a Japanese light tank company directly into the beach assault in September 1944. Lieutenant Colonel Arthur J. Stuart later remarked that the destruction of the Japanese tank-infantry counterattack left "no grounds for smugness in regard to our antitank prowess. Had the Japanese possessed modern tanks instead of tankettes and had they attacked in greater numbers the situation would have been critical."

General A. A. Vandegrift, the commandant receiving the letter, had little recourse available other than to purchase incrementally some of the Army's M26 tanks, earmarking them initially as the Corps' *substitute* heavy tank while awaiting a better model to appear. A total of 102 of these machines had been accumulated by 1950.

Neither American service faced the unfolding of the Cold War with confidence. By 1947, US war planning focused on the first 12–18 months of a general war with the USSR. The outnumbered western allied forces would have to defend strategic redoubts like the Iberian Peninsula, Sicily,

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the Middle East and Japan, while occupying Iceland, Greenland, and the Azores. An eventual air and amphibious offensive, based upon the Suez-Cairo region, would attack the USSR in the event that the atomic air offensive failed and a long-term war ensued.

Military operations against the Soviet Army required dealing with a mature combined arms force that in 1945 already featured newer tanks forged from the experience of fighting the German Army from Moscow to Berlin. Among their more fearsome machines, the IS-3 heavy tank, first seen in mid-1945, featured an alarming 8 inches of well-sloped frontal armor and a 122mm cannon. Although production funds ran out with the end of the war, the US Army continued to develop all classes of tank designs and by 1948 reached a plateau of development where three tanks were ready for engineering, called T41, 42, and 43 for the light, medium, and heavy tank classes. Funds remained scarce, but the political and strategic surprise of the Korean War and the incipient Army Tank Crisis caused all of these to be rushed into production in one form or another.

CHRONOLOGY

1945

February 1: AGF rejects T30 155mm gun heavy tank, suggests Ordnance adapt 120mm AA gun as tank cannon
April 12 and May 3: T29 and T30 ordered into limited production (1,152 and 504 vehicles respectively)
May 31: Initiated T34 120mm gun heavy tank project with two pilot tanks
August 23: T29/30 production cancelled, with 12 pilots each to be built (later reduced to total of ten)
September 20: Development of HVAP for 120mm tank cannon approved

1946

January: Army classifies obsolete all M4 mediums except M4A3 (76mm) wet stowage
March 22: Commandant Marine Corps School reports to CMC that all USMC tanks are obsolete. Commandant later begins acquisition of M26 tanks from Army, building to 102 by 1950, classifying them as the substitute heavy tank for the force tank battalions
April 25: HVAP development continued for 90, 105, 120mm tank cannon
May 6: Approval of new weight classifications for types of tanks, reclassifying M26 as medium tank

1948

July: LtCol Walter B. Richardson joins Ordnance Technical Committee as Logistics Division, Army General Staff member
November: LtCol Arthur J. Stuart joins Ordnance Technical Committee as headquarters, USMC member

1949

May 19: Army General Staff approves T43 development including pilot vehicles using fiscal year (FY) 1949 funds

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1950
February 16: Initiated development of 120mm guns T122, T123; lighter more powerful versions of standard gun
September 1: Initiated 120mm HEAT ammo T153. Terminated T29, T30 heavy tank projects

1951
August 2: Initiated M51 heavy recovery vehicle project

1952
January 4: Army orders 80 T43 for $100,843,395 in FY 1951 funds
January 17: Initiated T57 120mm heavy tank with oscillating turret
February 6: All earlier 120mm cannon projects terminated except T123
April 10: Initiated T58 155mm heavy tank
May 15: Revised T43 design to T43E1; pilots remain T43 unless altered
December 1952–June 1954: Construction of all 300 T43E1/M103 heavy tanks at Chrysler Motors Plant, Newark DE

1953
April 29: Continued development HVAP-DS ammunition for 120mm, projectiles T102/T106
September 1: Declassified T43E1 to allow display of tank at Aberdeen with press releases
October 8: M51 heavy recovery vehicle classified standard
October 30: "Guns for Heavy Tanks" memorandum continued development of T123, initiated T179 and T204 120mm cannon for T57 and T110 tank projects; initiated 155mm cannon T180 for T58 heavy tank
December 18: Initiated improvement program for T43E1: $2.579 million to improve gun pointing system, power plant, train durability, and overall operational characteristics

1954
December 3: Initiated T110 120mm heavy tank project

1955
August 16: Terminated T34 project, disposed of two pilots

1956
January 24: Revised military characteristics M51, project terminated, production complete
April 26: M103 (T43E1) type standard
September 18: Terminated T110 heavy tank project in view of success of T43

1957
January 17: Terminated T57 and T58 heavy tank projects in view of success of T43
May 17: M103A1 type standard

1959
December 17: Terminated all 90mm, 105mm smoothbore, 120mm cannon development projects, continue 105mm T254 (US version) for M60 tank

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1961
November 7–December 14: USMC requested, Army approved modernization of USMC M103A1

1962
December 13: M103A2 type standard; 156 USMC M103A1 (including three pilot vehicles) modernized to this type, with a final batch of 52 M103A2 converted in 1968–69 for a total of 208

DEVELOPING THE T43 HEAVY TANK, 1948–55

The most promising heavy tank design of the postwar test vehicles remained the last one, the T34. The US Army and Marine Corps each had similar requirements for a heavy tank, namely to destroy the largest armored vehicles on the battlefield and attack fortifications. However, the equipment studies conducted by both services before 1950 rejected the weight, mobility, and maneuverability characteristics of the T34. A series of conferences held in 1948 at Detroit Tank Arsenal produced a concept for a new tank design that promised a horsepower increase of 2.85 per ton and a weight saving of 14.5 tons. Effectively, the T34 design was reduced in length and height, deleting also the assistant driver position. With the driver placed on the centerline of the bow, the way was clear for an advanced hull form. In a later stage, engineer Joseph Williams worked out a distinctive elliptical cast hull and turret, saving weight yet delivering the desired protection levels, using curved and sloped cast homogeneous armor at all angles and directions. The 120mm main gun also received a T122 redesign that weighed 85 percent of the modified antiaircraft gun installed in T34 as the T53E1, yet raised chamber pressure from 38,000 to 48,000psi. By employing cold working techniques using 100,000psi minimum yield strength steel, the T123E1 (later M58) 120mm gun, with a barrel 60 calibers long, later proved capable of firing a 51lb solid shot projectile at a muzzle velocity of 3,500ft/sec.

Initial Progress to 1950: Design and Specifications of a Heavy Tank

The complex heavy tank project T43 lagged behind the light and medium tanks under development by the Army, and at the time of the Korean War it only existed as a wooden mockup and a series of specifications yet to be reconciled. (US Army)

The Ordnance Technical Committee reported on December 1, 1948, presenting the heavy tank T43 as a feasible design ready for development. The new tank was to weigh 58 tons combat loaded, carry a crew of four, present 5 inches of frontal hull and turret armor plus a 4-inch gun shield, yet reach a speed of 27mph with its 810 hp AV-1790 series 12-cylinder gasoline engine. After a series of endorsements and reviews, the General Staff approved the development and production of pilot vehicles on May 19, 1949, using funds previously programmed for cargo tractors that had received cutbacks. The Marine Corps added its order for an additional pilot tank somewhat later.

Bringing the first production US heavy tank to the forces would take more than just good design work by the Ordnance Corps, however. The British liaison officer to the US Logistics Division, General Staff, thought that even the wooden mockup order remained undesirable unless it did not preclude agreements arrived at in an upcoming Tripartite Tank Conference slated for March

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The first T43 pilot tank of the six ordered in mid-1949 was delivered to Aberdeen Proving Ground for tests two years later, but fitted with the T122 tank cannon already replaced by a lighter and more powerful development gun. (US Army)

1949. Already, there were rumblings of discontent from the Transportation and other branches of the Logistics Division, Army General Staff, on the burdens to be placed on industry, logistics, and transportation resources by the introduction of such a heavy tank to active service.

Fortunately, the Ordnance Technical Committee meetings were attended already by two staunch advocates of the heavy tank, among other tank matters. For the Marine Corps, Lieutenant Colonel Arthur Stuart represented his service as the ordnance staff officer in the Plans and Policy Division, now headed by Major General O. P. Smith. Thus the same two officers who had advised the commandant in 1946 of the inadequacy of the Marine Corps tank arm were positioned ideally to remedy the problem. Stuart's main collaborator in this effort on the Army side was another combat-tested tank officer like himself. Lieutenant Colonel Walter B. Richardson had led his 1st Battalion, 32nd Armor, usually assigned as the spearhead of 3rd Armored Division's drive from Normandy to Germany in the last year of the war. He was detailed from the Logistics Division of the Army General Staff. Both officers worked together to keep their respective chiefs in touch with any complications in the tank programs.

Each service could muster positive information from recent studies and policy boards supporting the development and procurement of a capable heavy tank. For the Army, the Army Field Forces had sponsored an Advisory Panel on Armor, chaired by Major General Ernest N. Harmon (retired) and his deputy, Brigadier General Bruce C. Clarke, then assistant commandant of the Armor School. The panel reported out to the Army's chief of staff on February 18, 1949. Not only did this board strongly endorse the heavy tank, but also the tank in general was designated as the main antitank weapon of

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Arthur J. Stuart, pictured here as a colonel, coordinated the Marine Corps effort to obtain the Army's heavy tank from initial concept through production orders, even as the Army's interest in the project began to lag. (USMC)

the Army Field Forces, thus becoming even more numerous because of the replacement of the previous wartime tank destroyer units at all levels of the field forces. The board then established the policy requirement for a heavy tank battalion (69 T43 tanks) among the four in each armored division, plus a corps armored cavalry group equipped with three heavy tank battalions, for a total of 276 T43 tanks of the 1,111 tanks envisioned for the typical Army corps. The board determined the immediate mobilization requirement (12 division force) for heavy tanks to be 1,476 and the initial requirement for a wartime 64-division force to be 11,529 heavy tanks! There should be little doubt that the report reflected the years of World War II spent facing German armor that included too many tanks that outgunned and outweighed the American armored forces.

On the Marine Corps side, Lieutenant Colonel Stuart keyed the formation of the Armor Policy Board by General Smith's Plans and Policy Division that reported to the commandant of the Marine Corps on April 15, 1949. Chaired by his immediate supervisor, Colonel William F. Coleman, Stuart's board consisted of five tank battalion commanders of the Pacific War and a captain recorder. The Armor Policy Board reviewed the Marine Corps tank position for present and future requirements, as well as that of related vehicles such as amphibious tractors and specialized support vehicles. The tank requirements dispensed with light tanks that had been discarded in the Pacific War as unsuitable for amphibious landings, and determined the requirement as a continuation of the organic tank battalion as established for the Marine Corps division in 1940, but equipped with modern medium tanks, not yet available. Furthermore, the board reaffirmed the wartime requirement for a corps-level reinforcing tank battalion, which had been discarded in 1944 to fill out more divisional tank battalions during the last war. From the moment it organized its first tank company in 1935, the Marine Corps had used a doctrine of tandem tank types for amphibious assaults and the defense against landings. The initial assault was to be supported by the lightest tank adequate to destroy beach defenses and support the infantry. A larger tank would then be brought into the beachhead from landing ships to prosecute the inland offensive as well as

A

M103 US ARMY, 1957 INITIAL MODEL

Only the US Army operated the M103 (T43E1), which was the initial production version with 98 minor modifications. After troop testing at Fort Hood, 72 of these were sent to Germany, initially equipping the 899th Heavy Tank Battalion in late 1957. The 120mm gun has the early muzzle with a blast defector that was later cut back because of excessive wear from firing. The remaining portion retained the fume extractor in place. The turret gun shield shows two .30cal coax machine guns, vice the .50cal guns specified for the original T43. Just behind the rangefinder on the turret top is the periscopic gunsight used by the gunner, who also had to operate the stereoscopic rangefinder. The commander's cupola has a .50cal machine gun capable of being fired from inside, but loaded only from the exterior. The exhaust diffuser on the top rear engine deck, under the turret overhang, caused severe heating of the bulge of the turret underside where the gunner sat, and an external heat shield was bolted to protect him. The hull rear shows the disassembled and stowed tripod travel lock for the gun tube. The depicted vehicle shows the markings of the redesignated successor 2nd Heavy Tank Battalion (120mm), 33rd Armor. The tactical markings indicate Seventh Army, 33rd Armored Regiment, Company D and vehicle number 43, i.e. fourth platoon, third tank.

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to repel any armored counterattacks launched against the landing force. Because the medium tank had quickly become the standard for the beach assault by the Marine Corps division in World War II, the force tank battalions of the postwar era would require heavy tanks. For this purpose, the Corps had acquired a limited number of M26 tanks since 1946, and the commandant had designated these as "substitute heavy tanks."

Thus, from a different set of operational needs, the Marine Corps determined the same requirement for heavy tanks as its larger sister service: the destruction of the heaviest enemy tanks and fortifications.

> Heavy tanks are required in the assault only when enemy armor is capable of immediate intervention, or heavy fortifications are present in the landing area. But in such cases heavy tanks will be vital and there exists, therefore, a requirement for a flotation device for heavy tanks. No such flotation device is under development.

The board concluded that all force tank battalions (to be provided only in wartime) be heavy tank battalions, and that some heavy tanks be provided to the divisional tank battalions in peacetime to create a pool of trained crewmen. The total requirement for heavy tanks comprised three force tank battalions supporting four divisions when mobilized. The Armor Policy Board did not attempt to tally the total vehicle requirements, which would be drawn from future orders from Army production lines in any case. After the commandant approved the policy study, the staff sent the projected Marine Corps tank requirements (exclusive of the Marine Corps Reserve) to the Army in November 1949, which included for the heavy tank only 19 tanks active (12 for training), but a total of 504 for the first year of wartime mobilization. This last figure included 55 each issued to three force tank battalions and another 25 for training, the rest being earmarked for replacement and depot stocks.

Another view of the first T43 pilot tank illustrates the considerable size of the 3-ton gun, with a barrel 60calibers long, all of which had to be accommodated and balanced within the confines of a hull and turret capable of carrying the required crew of five. The pistol port on the turret side was an early deletion. (US Army)

War and the Tank Crash Program, 1950–54

Progress continued on the T43 design and its key components. After a major conference held at the Detroit Tank Arsenal, October 18–19, 1949, and a

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detailed review of the wooden mockup and major components of the design, a new set of military characteristics was agreed upon and published on April 24, 1950, and then approved by the Army Staff on June 28, 1950. Major changes raised the weight and lowered the ground clearance of the T43 from the original project. Besides the incorporation of engineer Williams' elliptical cast hull and turret, the conference increased the turret ring diameter to 85 inches and added a second loader to the crew for lack of available automated loading machinery. A concentric recoil cylinder, similar to those of lighter tanks, replaced the previous triple cylinders. Remote controlled machine gun blisters were deleted, along with a direct fire telescope, commander's panoramic sight, and a lead computer. Army Field Forces also preferred two coax machine guns, requiring more ready ammunition stowage and deleting the direct fire telescope from the gunner's position. An electrical loader safety was added to force the second loader to move away from the recoiling breech in order to clear the gun to fire. The tank commander received a set of gun controls allowing him to override the gunner and realign to a new target and fire the weapon if necessary. A vane sight was fitted to the turret top to assist in reorientation. An auxiliary engine-generator set was added to permit operation of tank electrical systems and battery charging without the main engine running. Quick-change barrels for the main gun were specified and a manual cant-correcting device required for increased accuracy in gunnery.

The resulting changes necessarily slowed the progress in design and pilot vehicle production, but development of related components continued apace. Of special importance, Ordnance obtained approval for the development of the lightweight 120mm tank cannon in two different

The sixth pilot tank was a Marine Corps order, by the service eventually operating most of the tanks produced. Here it is exhibited at the Quantico development center with the M48 medium tank. The earlier production of the M48 led to confusion that it passed design elements to the heavy tank, whereas the converse was true. (USMC)

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designs, T122 and T123, on February 16, 1950. The T122 gun used contemporary manufacturing processes, and the T123 the more advanced cold working techniques.

These incipient delays and redesigns resident in the T43 project proved most inconvenient upon the invasion of the Republic of Korea by its northern neighbor, the People's Republic of Korea. The North Korean onslaught of June 25, 1950 rolled through its immediate objectives, occupying the capital Seoul on June 28 and continuing to drive the fleeing ROK troops to the south. This crisis in Korea seemed worse for the United States because of the nagging strategic possibility that this event was but the first move in a global confrontation with the Soviet Union, with Western Europe their next and most valuable objective.

As the services responded to the immediate need to reinforce the Far East and engage the North Korean invader, the Army and the Marine Corps could only despair at the completely inadequate state of armaments available, apart from accumulated stocks of World War II equipment, spares, and munitions. The obsolescence of the US tank arsenal in 1950 could not be restored by the T41-T42-T43 family of new designs still immersed in the details of development, with none ready for immediate production.

The US Army declared a "Tank Crisis" that it matched with a "Crash Program" to advance the new designs to production by any plausible means, while refitting and refurbishing its limited supply of battle-worthy tanks, mostly mediums of the last year of World War II production, aided by an ongoing rebuild of the venerable M26 to an M46 modernization version in the medium tank class.

At this point, the T43 heavy tank existed solely in the form of its wooden mockup, already rendered less relevant by the redefined military characteristics of the April 24, 1950 decision memorandum of the Ordnance Department. In the rush to recapitalize the US tank fleet via a Crash Program, the heavy tank project remained the most vulnerable to being sidelined among the myriad priorities of the moment. In fact, the Army chief of staff, General Joseph Lawton Collins, had already made damaging statements about the

B

M103 OF 2-33RD ARMOR ON MANEUVERS IN WEST GERMANY, MAY 1959

On exercises in Germany, this M103 of the 1st Platoon, D Company, 2nd Battalion, 33rd Armor prepares to fire at the aggressor vehicles opposing the advance of the medium tanks it is supporting. It has already jettisoned its four 55-gallon drums of gasoline carried on the rear-mounted kit at the assembly area. While moving, the gunner and tank commander have searched for targets using their gunsight and binoculars, but the loaders have remained confined to their seats as the tank pitched and swerved over the ground. They cannot assist in spotting from the roof hatch because an exposed head would block the gunner's sight. Once halted, they await the firing command that will tell them which of the three propellant charges and four projectiles (HE, WP, AP, and HEAT) they will strip from the racks. If the gunner has to traverse the turret, they literally must dance around inside the hull while loading, chasing the gun, because of the lack of a turret floor or "basket" in the M103 variant. The commander has slewed the turret toward the announced target, aligning the primitive vane sight with a notch on the gun muzzle and the target. The gunner locates the target, ranges it mechanically with the stereo rangefinder, then applies the range to his periscope sight and fires on command. In the event of battle damage, the rangefinder can be used to aim the gun, but there is no auxiliary telescope aligned with the gun as in other tanks of the period, because the gunner had to be located far from the gun with the rangefinder. Considering the additional unmodified flaws in the turret pointing system and lack of a ballistic computer, one can imagine how welcome the arrival of the improved M103A1 was for the tankers of this unique army unit, who wore a distinct unit patch as shown.

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The Marine Corps pilot tank still carried the bipod travel lock for the 120mm gun, later replaced by a tripod version. The early attempt to engineer a T-shaped blast deflector at the muzzle failed because of the tremendous heat and pressure it received upon firing. (USMC)

tank program recommended in the Advisory Panel on Armor, the cost of which must have shaken him. "Lightning Joe" had served as a division commander in the Pacific and the VII Corps commander in Europe during WWII. However, by the spring of 1950 he was making published statements to the effect that tanks as weapons systems were about to become obsolete, particularly medium and heavy tanks.

This was the moment for the two lieutenant colonels previously mentioned to make their key contributions. Arthur Stuart received from Walter Richardson an informal review of tank policy and procurement in March. Although the tank programs were proceeding with the highest priority of development, including their new guns, Richardson revealed a three-way struggle between the Infantry, Armor, and Ordnance branches over the T42 medium tank project, with the infantry desiring greater antitank firepower from the 90mm gun. Richardson warned that the Industrial Mobilization Branch of his Logistics Division of the General Staff had presented a study to the chief of staff "through the back door," recommending termination of the heavy tank project because of the inability or extreme difficulty of the national war economy to support the production of such heavy armored vehicles in sufficient quantities to equal and then surpass Soviet stocks and production, and because experimental ammunition types for the T42 medium tank 90mm gun could be expected to penetrate an armor basis equivalent to present Soviet heavy tanks.

Stuart wrote to his seniors that

> Lieutenant Colonel Richardson vehemently stated that the proposal to abandon the heavy tank was "inalterably opposed" by Army Field Forces and all cognizant operational sections within the General Staff for the following reasons:
>
> 1. The improved experimental 90mm HEAT ammunition is unproven

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2. It relies upon a spin-stabilized HEAT type, easily defeated by spaced armor or standoff plate. Positive information exists that spaced and laminated armor were features of current Soviet tank development
3. The new 90mm HEAT ammunition is a low velocity round for which a high probability of hits could not be expected beyond 1,000 yards
4. That even though a medium tank armament lethal to all classes of hostile armor might be devised to overcome the limitations cited above, heavy frontal armor is essential.

Richardson assured Stuart that the proposal would be disapproved, but that the Marine Corps would be advised of any changes, and should proceed on the existing plans and schedules for development.

In the immediate aftermath of this exchange, the Marine Corps staff wrote a letter signed by the commandant of the Marine Corps on April 20 to the Navy Planning Group, advising in part that the Marine Corps had no heavy tanks on hand and that these must be made available to provide adequate defense against enemy armor.

Stuart and Richardson continued to collaborate and when Stuart learned that the Army was considering an order for only 80 T43 tanks in August, he urged the Marine Corps leadership to assert its requirements very quickly. Stuart thought the chief of staff of the Army was in a difficult position, for Department of the Army armor panels had not supported his previous position. General Clarke, now commanding a brigade in Germany, had made several personal appeals since the outbreak of the Korean War for "immediate initiation of quantity heavy tank production." The Army Field Forces had urged the chief of staff to approve quantity production, with the endorsements of all the Army General Staff principals. As a result, the chief of staff had approved "limited" heavy tank production to activate a "limited number of heavy tank battalions for evaluation."

Stuart reported on September 11 that he had been contacted that month by three General Staff officers, each urging that the Marine Corps make known its stand on heavy tanks as an important contribution to the present situation. "The Army interest is apparent – They are very anxious for the Marine Corps' stand in writing as an additional lever to obtain full heavy tank production." Accordingly, the commandant of the Marine Corps signed his "top secret" letter to the Army chief of staff on September 15, indicating his concurrence with the Department of the Army Panel on Armor, including parts pertaining to the heavy tank. He affirmed the Marine Corps' requirement for a limited number of heavy tanks similar to the T43. He asked whether production was planned for that vehicle and, if so, requested the estimated availability and unit cost data be sent to him.

The Army Staff confirmed its order in December to produce 80 T43 tanks for a troop test. On December 20, 1950, the fiscal director of the Marine Corps confirmed to the Navy's comptroller, the Marine Corps' order for 195 T43 heavy tanks, at $500,000 each. This order would be extended in the following fiscal year to a total of 220 heavy tanks.

Engineering and Producing the T43 Heavy Tank

Now that the T43 project had enmeshed itself firmly in the Army's Crash Program, the complexities of its design as well as the periodic changes to its characteristics and equipment began to penalize it under the pressures of time

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The production version T43E1 received its initial specifications a year after the delivery of the first pilot T43, and only five months before the production run began. Changes would be incorporated to the assembly line while field reports arrived with their recommendations. (US Army)

even as preparations began for series production at a designated Chrysler Motors plant at Newark, Delaware. By the time that the first pilot T43 vehicle had been delivered to Aberdeen Proving Ground, in June 1951, several of its major features already had been altered by the Army and Chrysler. In fact, Ordnance designated the production version T43E1 on July 17, 1952 and it proved to be an evolving entity throughout the assembly of the 300 tanks between December 1952 and June 1954. Pilot and early production tanks continued to be tested and resulting changes applied to the assembly line, and improvement kits were made for early production tanks that had not been altered to current production standards.

Between the order for the first pilot tank and the end of production at the Newark plant, the M103 received four major Changes to Military Characteristics orders, and no fewer than seven production conferences to discuss deficiencies and corrections. The tank's weight increased and the ground clearance and speed fell, primarily because of the weight of increased armor thicknesses ordered for the hull lower front and floor, and the turret front, sides, and gun shield. The principal armament was confirmed as the T123E1, while the first pilot tank had the more conventional T122 for which the ammunition was not interchangeable. There were myriad details of lesser gravity, such as the addition of an external heat shield to the turret armor under the gunner's seat, because the exhaust deflector raised temperatures so severely.

The crucial selection of the T123E1 tank cannon affected the development of ammunition significantly, but not before the appearance of a strange attempt made by Detroit Arsenal in September 1950 to study a new turret and gun arrangement calculated to reduce costs and overall weight to 45 tons. The much-reduced turret would mount the T15 90mm cannon developed as an experimental upgrade to the M26 tanks of 1945 with separate cased ammunition of very high velocity. Apparently the 90mm gun advocates in the Army Staff had not yet conceded their positions from the spring.

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This early production T43 served at Fort Knox as a testbed for modifications to the production line, and shows how the tripod travel lock stowed in the hull rear, over the external telephone box. The tank commander's vane sight stands out clearly below the barrel of his .50cal gun, mounted on an elaborate cupola permitting firing the gun from inside. (US Army)

The development of the very powerful T123E1 120mm cannon, with its 48,000psi chamber pressure, enabled the Army to defer the use of more complex and expensive ammunition programs for this caliber that had continued in development since the end of WWII. In order to defeat present and future heavy tanks of the Soviet Union, much emphasis had been placed on the use of high velocity armor piercing (HVAP) and discarding sabot (HVAP-DS) rounds. Both of these rounds depended on critical materials for their production, with sub-caliber penetrators of tungsten carbide, surrounded

Sometimes mislabeled an early mockup, this version was actually the last attempt by the Army Staff to scale back the tank and revert to the 90mm cannon T15, with resulting weight savings. For the moment, the heavy gun advocates maintained their control over the design and production. (US Army)

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The mere size of the ammunition signaled its potency. The final version 51lb. 120mm solid shot armor piercing (AP) projectile required a separate propellant casing of 56lb. to provide 4,318 foot-tons of energy and a 3,500ft/sec muzzle velocity capable of penetrating 7.7 inches of 30-degree sloped steel plate at 2,000 yards. (Author)

by a high strength aluminum carrier component. These rounds caused very high bore erosion and reduced gun tube life, but produced high muzzle velocities and relatively flat trajectories to the target. On the other hand, comparative studies of kinetic damage by these projectiles against high obliquity armor (i.e. 60 degree) at realistic battle ranges showed no better results than that of full caliber armor piercing shot rounds made of high grade steel and fitted with a ballistic cap for reduced drag (APC).

At the same time, advances to new electrical fuses for shaped charge high explosive antitank projectiles, called HEAT rounds, allowed much higher muzzle velocities without degrading penetration performance on impact. Combined with the design of new cone liners to the shaped charges, they held the possibility of penetrating armor to the maximum theoretical thickness at all ranges.

By the time of the Detroit Conference of October 1949, the candidate ammunition for the 120mm guns T122 and T123 was presented as shown in the table below:

Characteristics	**T122**			**T123**		
Projectile	APC	HVAP	APDS	APC	HVAP	APDS
Weight (lb)	50	36 (core: 15)	30.3 (core: 15)	50	32 (core: 12)	23 (core: 12)
Muzzle velocity (fps)	3,100	3,550	3,800	3,300	4,000	4,200
Penetration, 1,000 yards at 30 degree obliquity (inches)	8.4	10.9	13	9.2	12	13.6
Penetration, 2,000 yards at 30 degree obliquity (inches)	7.6	8.8	11.5	8.3	10.2	12.3

However, the new T153 series 120mm HEAT ammunition promised initially 13 inches of penetration and later reached 15 inches of penetration at all ranges. A muzzle velocity of 3,750fps assisted its accuracy. Accordingly, once the T123E1 gun was selected for the production T43E1, the required ammunition devolved to APC, HEAT and high explosive (HE) rounds, each paired with separate and non-interchangeable propellant casings.

In some other related programs, the complications posed by the T43 were reduced, because the Army and Marine Corps dropped the requirement for a flotation device in view of new Navy landing craft capable of permitting main gun firing under way. The Marine Corps eventually joined the Army in dropping the requirement for a bulldozer kit for this particular tank.

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A month before the last T43E1 rolled off the production line in 1954, Ordnance exhibited one at Aberdeen with the rest of the post-1950 stable of Army tanks. Here the T43 overshadows the M48 and M47 mediums, and the M41 light tank, as pictured left to right. (US Army)

Delivering the M103 Heavy Tank

Even before production tank number 300 rolled out of the Newark plant, the Army's Ordnance Department recognized that the rush into production had resulted in a tank far from ready for issue to the troops. The steady work of the production conferences, meeting on average every four months, at first determined from testing of early production tanks that 68 modifications would be required to make the tanks suitable for the troop test desired by the Army. Ordnance authorized the diversion of two production tanks on April 22, 1954 to be rebuilt as pilot T43E2 tanks serving as testbeds for the required changes. By December 1955, the list had grown to 144 modifications, although changes incorporated in the final five tanks produced narrowed the final list of discrepancies to 114.

In the meantime, the Continental Army Command (CONARC), successor to Army Field Forces, had completed testing the production T43E1 tanks and found them unsatisfactory for issue to the troops as of June 20, 1955.

As part of the public demonstration at Aberdeen, the T43E1 fords the minimum 4 feet of water, without special preparation. A deepwater fording kit was designed that would allow immersion up to the turret top, but proved so unwieldy that it was rarely used, even in training. (US Army)

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The immense size of the turret, a single steel casting, is accentuated by the extreme overhang of the turret rear, seen here reversed with the gun in its travel lock. The elliptical shape of the cast turret and hull presented constant curvature of thick armor to incoming projectiles. (US Army)

The entire production lot of T43E1 heavy tanks remained in storage at Newark, pending the refurbishing of the two T43A2 pilots and their evaluations.

What had happened? A combination of Korean War experiences and evolving design criteria in the Army had caught up with the heavy tank during its production period. It was not alone in this condition, for the companion T42 medium tank project had disappeared in 1951, and its

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M103A1, US ARMY, 1962 AND USMC, 1962

Entering service a year after the M103 was declared type standard by the Army, the M103A1 acquired by the Marine Corps contained the major engineering changes required by the original army trials and insisted upon by the Corps, which had ordered 220 of the 300 T43 series heavy tanks in 1950–51. The improvements of this variant convinced the Army to request a loan of 72 M103A1 from the Corps for its lone 2nd Battalion, 33rd Armor in Germany. These were shipped overseas in mid-1959.

Externally, the only differences from the M103 were the replacement of the right turret coaxial machine gun with a direct fire telescope, the movement of the gunner's sight to a position forward of the crew hatch and to the right side of the gun, and the replacement of the commander's cupola with a simplified vision ring and flex mount for the .50cal machine gun.

Inside the M103A1 there was a world of difference. The gunner no longer had rangefinding duties and concentrated on aiming through either his periscope primary or telescope secondary sight, indexing the ordered ammunition into his ballistic computer, and operating his gun switches. Turret mechanisms for traversing and elevating were now a more powerful electrical amplidyne system linked via a ballistic drive to a computer that received range input from the rangefinder, now operated by the tank commander. A turret basket allowed the two loaders easy access to the ammunition and gun breech regardless of the tank's position and orientation. Ammunition stowage increased from 33 to 38 rounds of 120mm.

The tanks depicted are from the 1st platoon, A Company, 2nd Battalion, 33rd Armor and 3rd Platoon, C Company, 2nd Tank Battalion, 2nd Marine Division. The ammunition shown were the standard types, all available after 1959: high explosive (HE) and white phosphorus (WP) sharing the same propellant charge, then armor piercing (AP) and high explosive, antitank (HEAT) each with distinct propellant charges.

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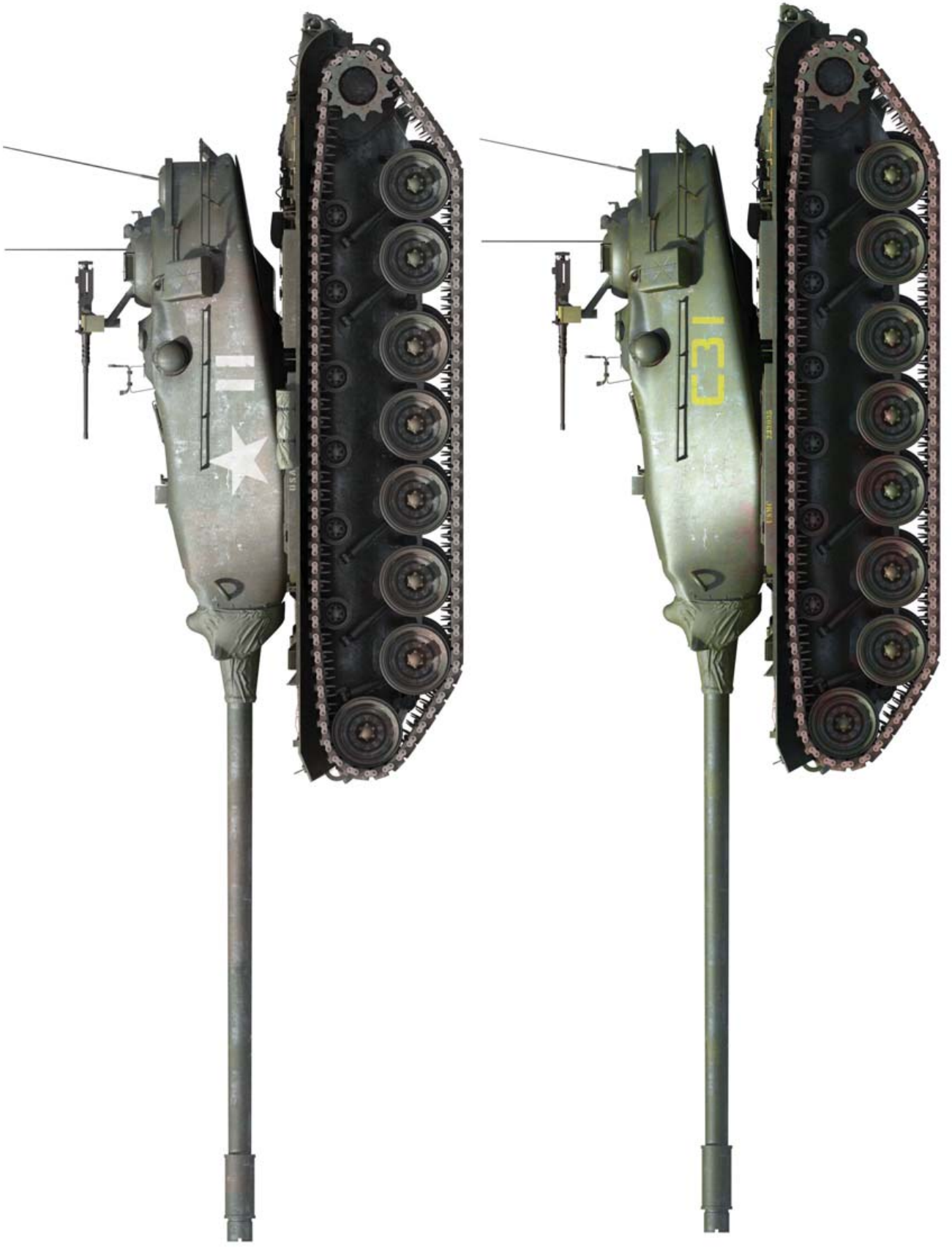

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The production run of 300 T43E1 tanks completed, there remained some 114 defects yet to be corrected, and the most serious ones, centered around turret controls and the fire control system, required yet another two pilot vehicles for engineering testing. The second T43E2 pilot demonstrates the repositioned gunner position on the right side of the gun and the simplified commander's cupola. (US Army)

replacement T48 tank, incorporating some of the T43 advances and hardware, was rushed to type standard service with the Army in three different variations of the M48 in October 1954, one of which was only fit for training because of ballistic deficiencies of the hull! Clearly, a portion of the Army Crash Tank Program had indeed "crashed."

For the T43E1s languishing in their storage yards, the most critical deficiencies centered mostly around the turret controls, gun pointing and training system, fire control system, power plant, and overall operational characteristics. Wartime experience had demonstrated the need for a direct fire telescope as a backup sight for the gunners in all tanks. The provision of a turret floor that rotated with the turret to support the crew actions serving the main gun and machine guns remained paramount. The overloading of the gunner with both gun controls and rangefinding duties was no longer advisable. The turret controls and machinery did not maintain accurate gun lay or retain calibration well. A tank expected to fire at long ranges required a proper ballistic computer and cant corrector for the main gun. Apart from the tank, there were problems in ammunition quality control that would dog this program for several years.

Moreover, by the end of 1955 there was no longer a sense of urgency in the Army for the heavy tank. The Korean War and its associated crises had subsided. The Army now focused on NATO and contingencies related to fighting in Europe, perhaps under nuclear warfare conditions. Nor was the Army budget benefiting well from typical interservice rivalries of the time. The specific fate of the 80 Army T43E1 tanks and the long-delayed "troop test" paled by comparison. Therefore, the Army decided to forego the complete refurbishing of its T43E1 set and opted for applying only 98 modifications, retaining the stated turret and fire control deficiencies. Because the Army no longer required the T43E1 in excess of the troop-testing requirement, CONARC agreed to the limited modification plan in November 1955. On February 25, 1956, the Army authorized the application of the modifications, and on April 26 Ordnance classified the tank, combat, full tracked, 120mm gun M103 (T43E1) and the 120mm tank cannon,

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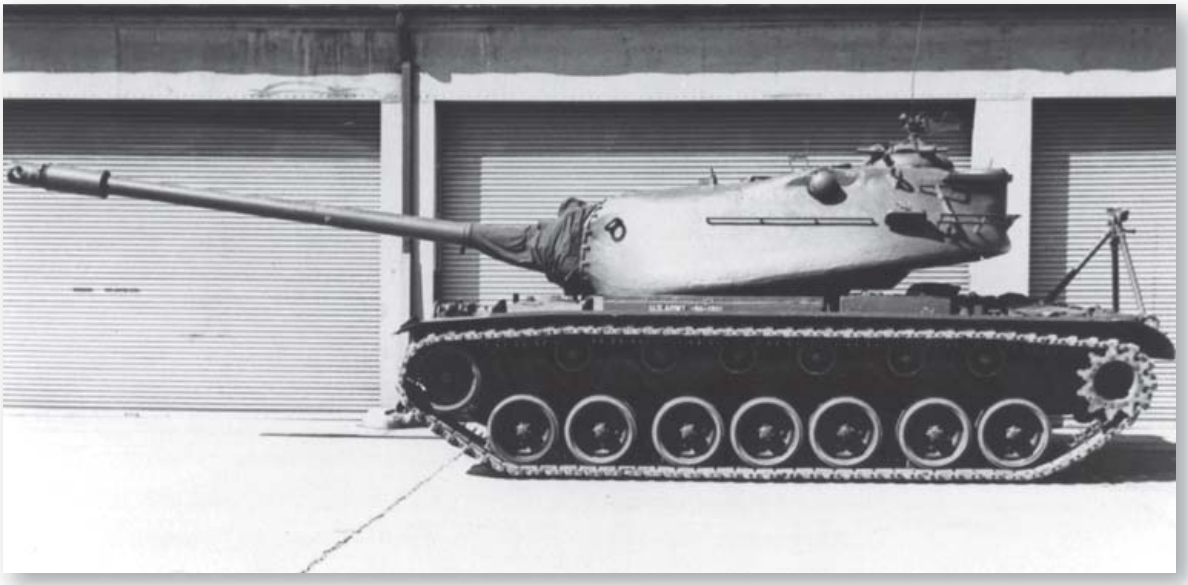

The changes wrought in the T43E2 altered little of the vehicle's exterior appearance, but major design overhaul produced a much more fightable vehicle, thanks to improved turret controls, the addition of a turret basket, and the more efficient positioning and splitting of duties between commander and gunner. (US Army)

M58 (T123E1) as type standard. By early 1957, the 74 army tanks had been modified to M103s and shipped to Fort Hood, Texas, for the troop test. The six other production tanks remained in Ordnance hands as test vehicles.

The Marine Corps, on the other hand, continued to hold firm operational requirements for its 220 heavy tanks and refused to accept them as M103s. While the T43E2 pilot tanks were reconstructed and tested, its tanks languished at Newark. Upon the outset of the Korean War, the Corps had stood up two of its force tank battalions, 7th and 8th, and the 8th Tank Battalion remained in service, but with no heavy tanks yet available for it. Far from seeking a troop test, the Marine Corps expected the Army to complete the development project and provide the contracted tanks.

Bringing the Project to Completion: the Marine Corps' M103A1

The most complex elements of the T43E2 project stressed the redesign of the turret in order to provide "...a reliable and stable sight that will withstand shock loads engendered by cross-country operation and near-penetrating hits on the turret body by large caliber projectiles." On May 26 and 27, 1953, the conference decided to move the gunner's position forward next to the main gun, in order to make use of a direct fire ballistic telescope mounted to the right side of the gun mount. In addition, the re-engineering of the turret would include a new gun control system, a fire control system not only including the telescope sight, but also a ballistic computer connecting the gunner's periscope sight to the tank commander's rangefinder. The turret basket, or rotating floor, would complete the major components not later applied to the Army M103 version. The tank commander's machine gun cupola was also simplified to a flex mount operated only from the outside of the tank.

Today's observers may rightfully stand aghast at the failure to incorporate what must appear to be normal tank design and gunnery standards in the T43 production vehicle. One can only conclude that the original concepts for fighting the tank must have remained more akin to that of a long-range sniper instead of a fighting vehicle fully capable of entering the melee that is

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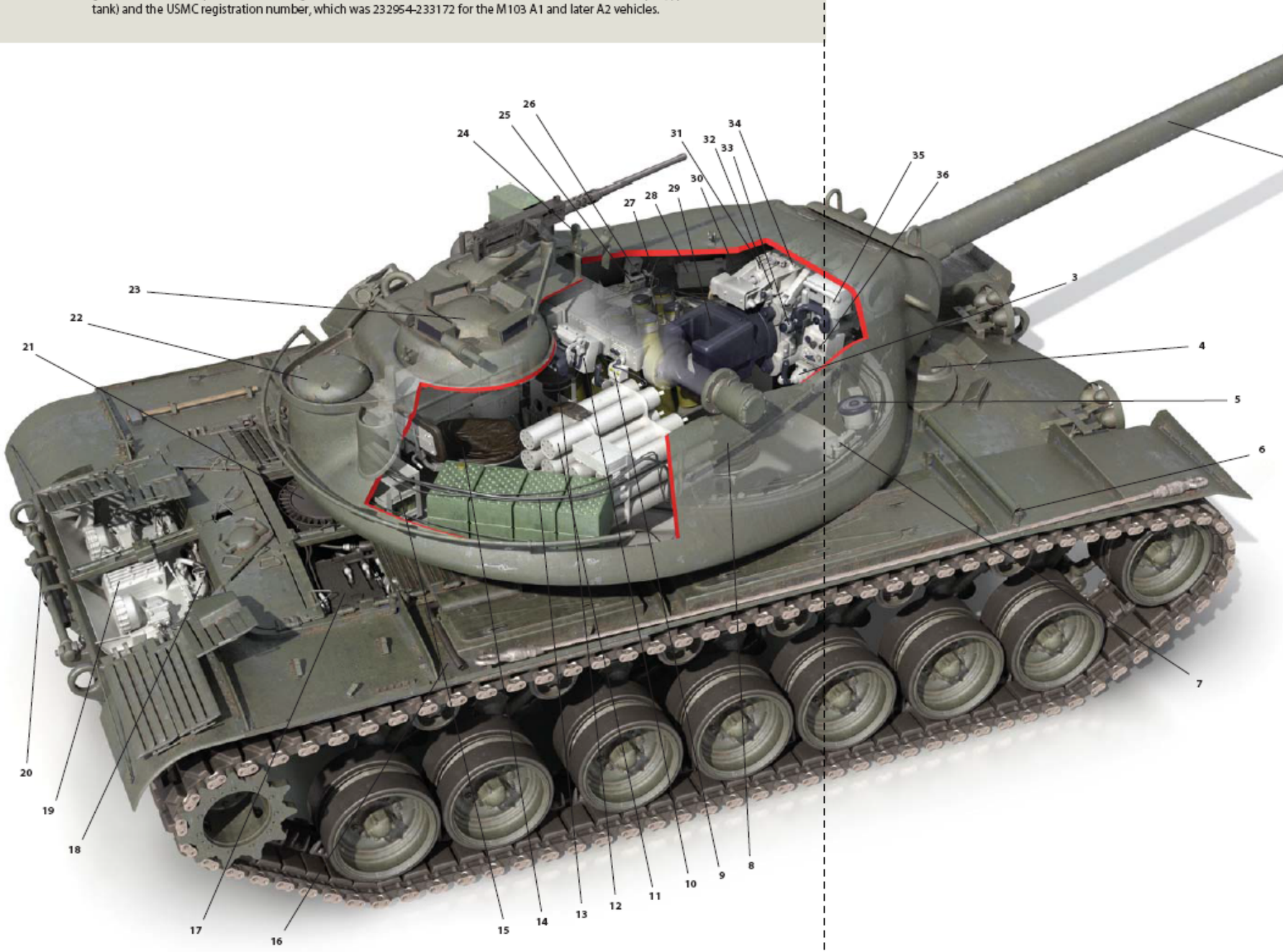
M103A1 IN USMC SERVICE

This tank usually received the standard USMC semi-gloss green No. 1612 exterior vehicle paint. Apart from bare metal surfaces, cushions, instrument dials and switches, or specially finished weapons, the interiors were painted a white semi-gloss. The minimum prescribed markings were the tactical number on the turret side (i.e. "C-25" for company, platoon and tank) and the USMC registration number, which was 232954-233172 for the M103 A1 and later A2 vehicles.



Key

1. Bore evacuator
2. Cannon, 120mm L60, M58 (T123A1)
3. Gunner's control handle
4. Mount, driver's infrared periscope, M24
5. Azimuth indicator, M28
6. Crew heater exhaust tube
7. Turret traverse gearbox
8. First loader's seat
9. Commander's gun selector switchbox
10. Rangefinder, stereoscopic, M15
11. Projectile racks, 120mm
12. Second loader's seat
13. Radio set, AN/GRC-3 series
14. Commander's seat
15. Ammunition boxes, .30 and .50cal.
16. Auxiliary engine exhaust tube
17. Auxiliary engine/generator
18. Transmission oil filler tube
19. Transmission, CD-850-4B
20. Main gun travel lock (stowed)
21. Forward cooling fan, AV-1790-7C gasoline engine
22. Turret ventilator
23. Commander's cupola, M11
24. Vane sight
25. Turret ventilator switch
26. Loader's safety button
27. Ready charge cartridge racks
28. Spare periscope box
29. Breech assembly
30. Coaxial machine gun, .30cal.
31. Equilibrator and frame
32. Elevation quadrant, M13
33. Telescope, M102
34. Periscope drive mount
35. Gunner's periscope, M35
36. Ballistic computer, M14

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The Army opted for 98 of the simplest production line upgrades and declared its 80 tanks as the type standard M103 tank. Only the Marine Corps took the complete set of modifications for its 220 vehicles and placed them in service as the M103A1 tank, pictured here. When these entered service in 1959, the Corps had already waited 10 years for its requirement to be met. (USMC)

armored warfare. The fleeting engagements of the Korean War between opposing tanks had reinforced, however, the decade old requirement for agility and speed of reaction in a combat vehicle.

Engineers used current shipboard gun mount technology for the new gun control system developed to replace the continuous-flow electro-hydraulic traversing and elevation mechanisms. The all-electric amplidyne system used powerful servo-type motors with amplified electrical controls to provide both the rapid movement of the heavy turret as well as the finer movements, provided by small hydraulic motors, required to lay the gun within a fractional mil of the intended target. The rangefinder, now operated by the tank commander, provided range readings out to 4,400 yards, mechanically linked to an analog ballistic computer that applied the required super elevation to the gun. The gunner's periscope sight provided a simple crosshair, with lead and aim correction lines. By indexing the loaded ammunition type into the ballistic computer, the proper elevation for the measured range was applied mechanically to the gun, leaving the gunner free to take aim and watch for target effect or needed adjustment. Cant correction was also applied to the gunner's sight picture and the tank commander's rangefinder for greater refinement of the fire control solution. The tank commander, if necessary, could control and fire the gun by means of his rangefinder, assisted by the same mechanical aiming corrections delivered to the gunner's periscope sight. In the event that the fire control system was disabled, the gunner's new direct fire telescope permitted him to estimate the range to the target and engage using the graduations of the ballistic reticules provided for the two different armor-defeating munitions.

Finally, the provision of a turret basket greatly assisted the two loaders as they moved around the turret to pull separate cased ammunition from the stowage racks, load the projectiles and propellant casings, step away from the gun, and clear out the spent propellant case before repeating their tasks. With these features and the more rapid and precise turret machinery, the T43 had arrived at true combat potential.

The commandant of the Marine Corps notified the Army chief of staff on March 28, 1957 that he was satisfied by the Army's test results reported earlier that month, and determined the T43E2 as suitable for combat use. He requested the modification of all 220 USMC heavy tanks to that status. On May 17, 1957, the Army raised the T43E2 to type standard as the M103A1, and completed the Marine Corps modification program in July 1959.

More efforts remained in the offing before the delivery of the M103A1 to the Marine Corps took place, however. Some ammunition for the M58 120mm gun had also failed in its trials and considerable work remained in terms of quality control before production could take place.

Although the high explosive (HE) round T15 had been under development since 1945 for the T34 heavy tank, it later had improvements in fusing and the addition of a tracer element. It was not standardized until it completed firing tests in October 1955 as the T15E3.

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The solid steel armor piercing, ballistic cap (APC) projectile, T116, proved much more problematic in its development. Malfunctions in the windshield adherence, tracer malfunctions, and loose closing plugs caused a halt to tests of the T116E5 in August 1954. The T116E7 passed CONARC testing in January 1957 and was designated as suitable for use. However, the high firing pressures and temperatures caused such bore erosion that tube life was 150 APC rounds compared to 500 of HE.

The final and most difficult munitions for this tank, the shaped charge high velocity HEAT ammunition, remained most desirable because of its 15-inch armor penetration rating. The T153 series progressed through a series of inconsistent tests, some showing remarkable accuracy and others plagued with fin defects. By May 24, 1957, the T153E8 with heat-aged natural rubber obturators was passing the required temperature extreme tests with dispersion of as little as 0.16 mil at 4,000ft per second. CONARC standards were 0.3 mil. However, fusing failures had jinxed four of six penetration test shots. The Army worked through January 1958 to make the HEAT ammunition safe, reliable, and effective. Throughout its service life, however, the Army continued to upgrade and improve the 120mm HEAT round. Its current version in 1961 was the T153E13C, continuing to a final E15 by its withdrawal from service. Similar conditions accrued to the contemporary 90mm and 105mm HEAT munitions of the Army tank programs.

The M103 series in service proved very popular with its crews, who recognized its outstanding attributes in firepower and massive armor protection. A USMC staff sergeant poses at the firing range with an assembled high explosive munition, probably in 1959 as the first M103A1s arrived with the 1st Tank Battalion. The projectile base is placed in the cap of the fiber shipping container. (USMC)

THE M103 SERIES HEAVY TANK IN SERVICE

After troop testing, the Army sent 72 of its M103s to Germany for active service with the Seventh Army, equipping the 899th Heavy Tank Battalion at Hanau in late 1957. That battalion formed part of the 4th Armor Group in V Corps, and had operated M48 mediums in anticipation of receiving the new heavies. On May 12, 1958, the Army redesignated the 899th as the 2nd Heavy Tank Battalion (120mm), 33rd Armor, as part of its regimental lineage program. In both versions, this battalion showed a peculiar organization: four companies of 18 tanks, each organized into six platoons of three tanks each. With no tanks assigned to commanders above the platoon level, the platoons would train together with their companies at their assigned bases, but operationally serve as reinforcing platoons to the battalions of medium tanks in Seventh Army. Although there was some interchangeability with the M48 medium tanks in terms of automotive components, logistical support of platoons of M103s scattered around southern Germany, especially with their ammunition, must have seen daunting complications. In 1958, Lieutenant General Bruce Clarke was in his last year commanding Seventh Army, returning again in October 1960, as general and Commander in Chief, United States Army, Europe. So many years after serving on the Advisory Panel on Armor, he at last had his heavy tanks in service.

Records of this battalion's activities remain scarce, but the Army soon showed interest in enhancing its service by borrowing the improved M103A1 from the Marine Corps. The Army's request for the 72 tanks was agreed to

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In Germany, a single Army battalion of 72 M103 tanks operated in general support of the medium tank battalions of the Seventh Army. This M103 of the 2-33rd (120mm) Tank Battalion shows the rear rack used by the Army to hold four jettisonable 55-gallon fuel drums, fitted to both medium and heavy tanks because of the short range obtained with their gasoline engines. (US Army)

on March 11, 1959 and the tanks shipped to Europe during May and June. The terms of the loan included the Army's responsibility to return the tanks in like condition to the Corps. Until December 1965, there existed an additional option for the Army instead to furnish 72 new M60 tanks to the Marine Corps, likely as a contingency involving war and mobilization. In any case, the initial terms were met and the tanks returned to the Corps during 1963. Reorganized and redesignated on December 10, 1962 as 2nd Battalion, 33rd Armor, the former heavy tank battalion then reported to the 3rd Armored Division for operations.

The Marine Corps Heavy Tank Enters Service

Few weapons acquisitions projects in the Marine Corps, outside of aircraft, ever lasted as long as its heavy tank program, yet the Corps remained steadfast through the years 1948–58 in anticipating its service. The Army's Crash Program originally called for production of the first of 400 T43 tanks in August 1951 and this information stimulated the G4 of the Marine Corps to recommend that the pending special funds of the revised emergency budget for tank procurement "be defended to the utmost as of critical importance to the operational capabilities of the Marine Corps." However, we now know that General Collins retained his reservations over the heavy tank part of the Crash Program and that the T43 design was not yet mature enough for mass production.

Upon learning of the Army's decision to take its partially modified M103s in hand and otherwise close the production line, the commandant asked several hard questions in a February 28, 1956 letter to the chief of staff before stating the Marine Corps position on the program. Did the Army consider the T43E1 acceptable for combat use? What would be the status of spares and associated logistical support for the future, such as publications, training aids, and field services? What was the state of high explosive and armor defeating ammunition for the T123E1 gun and its future development?

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A Marine Corps M103A1 overwatches infantry in the distance on maneuvers at Camp Pendleton, California. Camouflage seems senseless for such a large machine, but breaking up the tank's outline remained useful. (USMC)

When the Army assured him of its continuing support for the tank, he opted to await the completion of the T43E2 pilot tanks and patiently released the funding for storage of the vehicles pending the final engineering decisions for the 220 USMC heavies.

Preparations and orders for receiving them in the Marine Corps took place in the second half of 1958. The Marine Corps turned down the Army jettison fuel system and winterization kits for its tanks, but restated its existing requirement for 309 deep-water fording kits, once redesigned for the M103A1. Because of the Corps' emphasis on amphibious operations, it saw no need for the bulky fuel drum racks mounted on the rear of the tank, nor did it anticipate procurement of the winterization kits. The fording kit in the end saw little use in service, because of the awkward ducting and tubing required to extend the exhaust to the height of the turret from underneath the considerable turret rear overhang.

Marines found the heavy tank recovery vehicle track, T107, and its sprocket had double the service life of the standard T97 tank track and ordered it from the outset for its tanks. This switch was made easy because the M51 heavy recovery vehicle, based upon the M103 suspension, had been delivered *three years in advance* of the heavy tank, despite being designed in late 1951.

The Marine Corps strived to provision its depots with required spares and ammunition well in advance of the tank's arrival in service. Orders issued to the Supply Activity, Philadelphia on January 30, 1958 highlighted potential shortfalls in spare 120mm guns and gun tubes (barrels). The commandant advised that the tentative quantity of 286 replacement tubes and 86 spare guns had been derived from Army "tube life" calculations based upon firing all types of ammunition. However, the Marine Corps planned to allocate 300 rounds a year per tank for training. Of these, 50 rounds would be armor piercing (APC) rounds, with a considerably greater tube wear than the other ammunition types. Thus the training rates had to

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A quick count from this aerial photo of the Las Flores tank park of 1st Tank Battalion reveals its 53 M103A1s in service, with a company's worth of M48 mediums in the back lot, perhaps to support reserve training. (USMC)

be considered as well as combat expenditures. In like fashion, the commandant advised on September 24 that the long term storage of the USMC tanks after their production would likely produce engine and transmission oil cooler failures of between 10 and 50 percent of the fleet before normal overhaul, and that stockages must be increased to compensate.

Finally the day came to begin shipping the M103A1 to the Fleet Marine Forces. Because one tank was retained by Ordnance for testing and configuration reference, the final number delivered to the Marine Corps was 219 and these were given USMC registration numbers 232954-233172. The initial priority of issue ordered in mid-1958 went to the 2nd Tank Battalion on the Atlantic coast in January 1959, with subsequent shipments to the Pacific and the 1st and 3rd Tank Battalions in February and March, respectively. After shipping additional tanks to schools and local maintenance floats, the Corps delivered the remaining 155 M103A1 tanks to its major depots on the West (88) and East coasts (67).

With the wartime 8th Tank Battalion disbanded in 1958, Marine Corps

Tank A51, carrying the A Company commander, 1st Tank Battalion, is poised at the edge of the tank park. The 1st Tank Battalion consistently displayed its unit crest on the tank bow, rear fenders, and side stowage boxes, in addition to standard tactical markings. (USMC)

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policy determined that heavy tanks would serve in peacetime with the three divisional tank battalions, forming the third tank company in each. Force tank battalions of three companies and divisional tank battalions of four companies remained the wartime planning organizations. However, by the end of 1958, the special considerations of the 3rd Marine Division, stationed in Japan and Okinawa since it stood up during the Korean War, argued against sending the heavy tanks there. The increased difficulties of road use and logistic support at such distances probably carried the most weight. In any case, the 3rd Tank Battalion instead retained mediums for its three companies, and the 1st Tank Battalion was ordered into the force tank structure beginning in April 1959. In keeping with Marine Corps organizational policy, the tank battalions did not change their designations, but the tank companies used the tables of organization for company, 90mm gun tank or 120mm gun tank.

This apparently experimental or temporary reorganization of 1st Tank Battalion at Camp Pendleton as a force tank battalion of all heavy tanks lasted only until March 1961, when the battalion returned excess M103A1s to depot and resumed the medium/heavy mix of the peacetime divisional tank battalion.

Heavy Tanks in the Fleet Marine Force

In Marine Corps service, the heavy tank posed no transportation penalties as the Army Transportation Corps had feared for its own case. Ships and landing craft procured since 1950 by the Navy had been designed for handling both the medium and heavy tanks, as well as the large LVTP-5 series amphibian tractors. The 62.5-ton M103A1 could be hoisted into the holds of attack cargo ships, driven on and off LST class beaching ships or floated out of dock landing ships in individual LCM-8 landing craft or two to three at a time in the LCU class tank lighter. Since 1950, the Navy had also changed landing craft conformation to permit firing tank cannon to each side and forward while approaching the beaches, thus eliminating the need for flotation devices developed during WWII.

The heavy tank companies did not supply afloat platoons for the routine deployments of reinforced infantry battalions to the Navy amphibious squadrons in the Mediterranean, Caribbean, and Pacific. They trained with their parent battalions and saw operational use mostly with major exercises at the regiment or division level. The two largest of these took place within a five-month interval and half a world apart. First off was a trans-Atlantic movement and landing exercise on the coast of Spain, Exercise *Steel Pike* (October–November 1964). Then the Navy's Pacific Fleet and Fleet Marine Force, Pacific carried out its Exercise *Silver Lance* at Camp Pendleton during February–March 1965. In each case, the heavy tanks participated with success. In Spain eight M103A1 heavies landed on the Atlantic Ocean beaches at Huelva to reinforce the operations of 21

These M103A1s have landed from a tank lighter or LST by means of a floating steel causeway as part of maneuvers. The rubber tires were carried as identification markers for its assigned contingent. The casual manner of the sailors and Marines indicates the tactical phases have yet to begin. (USMC)

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The Caribbean island of Vieques furnished one of the few ranges where the 120mm gun could safely fire all ammunition to the maximum range. Here the M103A1s of 2nd Tank Battalion advance after marking the objective with white phosphorus shells for a supporting air strike. The tank on the right carries a Korean War vintage 18-inch tank searchlight. (USMC)

mediums ashore, using the same landing craft. In the California exercise, the heavies were detailed to the aggressor force ashore and performed no landings, but maneuvered well against the landing force and helicopter-borne assaults of an exercise scenario eerily corresponding to the Vietnam situation yet to develop for the United States.

The Marine Corps heavies soon earned their own particular deployment mission, however. The Cuban Missile Crisis of October 1962 saw many forces from the US deployed afloat and to nearby land bases. But the 2nd Marine Division already had augmented the usual naval base security force

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M103A1, USMC, 1963 AND M103A2, USMC, 1964

The final version of the T43/M103 series heavy tanks was the M103A2 as modernized for diesel power and upgraded with some new hardware common to the new M60 series tanks entering Army service. The Army had already announced its upgrade for the M48 series to M60 standards, and the Marine Corps decided to modernize its tanks, including the M103A1, in the same vein.

The diesel engine modernization produced several advantages in the tank's performance, but it also improved the overall operability of the tank in several ways. Externally, the M103A2 changed the most around its engine compartment, engineered for the larger and heavier engine, and requiring more space for the cooling air to surround the engine and then exhaust through a new set of large louvered doors at the hull rear. The engine compartment top cover was a cast armor piece, with both solid panels and louvered covers permitting top access to engine components, fuel points, and the transmission and engine oil filler and check tubes. Lack of internal space caused the placement of large air cleaner boxes (the principal identification feature of the A2) on the fenders beside the engine compartment, with their two stage particle remover sections and scavenger blowers. The rear doors to the engine compartment allowed easy access to the transmission, final drives, and engine exhaust pipes. Both engine exhaust and hot cooling air exited the compartment through those louvered doors. In addition, the rear doors permitted the mounting of the first practical deepwater fording kits for both medium and heavy tanks of this period. The installation of rear doors also forced the movement of the external telephone (tank-infantry phone in USMC terms) to the left rear fender on the M103A2. Because of the added overall height of the engine deck, the travel lock for the gun tube now became a simple fold-down device similar to that used by the medium tanks.

The tanks depicted are from the 3rd Platoon, C Company, 2nd Tank Battalion, 2nd Marine Division and 1st Platoon, C Company, 1st Tank Battalion, 1st Marine Division.

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In garrison, tank demolition demonstrations proved popular events, frequently to support a unit raffle, charity drive, or similar fundraising event. The winners are presumably riding the tank wearing soft covers. (USMC)

at Guantanamo Bay, Cuba with a rifle company, medium tank platoon, and an artillery battery. After the crisis had passed, the "augmentation" became a permanent one and eventually grew to a rotating deployment of an infantry battalion on a six-month basis. Thus all three tank companies of 2nd Tank Battalion gained a routine deployment: the two medium companies to Caribbean and Mediterranean duty afloat, and the heavy tanks of C Company received the Guantanamo Defense Forces mission. In its final evolution, every six months a platoon leader would take five heavy tanks and two flame tanks by ship to Guantanamo, train, exercise and man a two-tank guard post, in revetments, overlooking the fences and minefields protecting the base from surprise attack. The heavy tank assignment to Cuba, justified by the presence of Russian IS-2 heavy tanks, SU-100 tank destroyers, and T-55 tanks, proved the sole "overseas" use of USMC M103 series tanks.

When the Marine Corps deployed its Pacific-based divisions (1st, 3rd, and part 5th Marine Divisions) to Vietnam, the heavy tank remained behind, for lack of suitable targets. At Camp Pendleton, C Company, 1st Tank Battalion, turned over its heavies to D Company, 5th Tank Battalion, and took medium tanks to war.

On patrol along the boundary of US Naval Base Guantanamo Bay, a pair of heavy tanks from C Company, 2nd Tank Battalion, carry out the only routine deployment overseas that this type tank experienced. The extra boxes of machine gun ammunition reveal the serious nature of this contingency mission. (Siebrand Niewenhous)

One Last Modification: M103A2

By this time, the Marine Corps had dieselized its tank fleet, and the Army had performed one last series of modifications to the M103, now exclusively operated by the Marine Corps. The Corps intended to procure the Army Future Main Battle Tank program for its next modernization program. But when it was terminated and a new US–German tank program (MBT70) was launched, a fleet modernization became necessary to extend the service life of its gasoline-fueled M48 and M103 series tanks. A May 1961 Marine Corps study of the available options rejected converting to the Army's new M60 tank, because it offered too little improvement over the M48 medium, and the Corps was satisfied that its M103A1 heavy tank remained superior to the M60 in both firepower and armor protection. A changeover to an entirely new tank ammunition family for what was considered an interim period also doomed any ideas of acquiring the M60 at this point. The M58 120mm gun had outperformed all other weapons slated for the new M60 at Aberdeen Proving Ground in October 1958 in terms of penetration, lethality, and accuracy, besting the British X15E8 that was eventually selected for the new tank.

The Army already had developed a modernization for its fleet of M48 mediums,

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incorporating the diesel engine, coincidence rangefinder, improved engine compartment, and gas particulate filtration system of the M60. These same improvements also applied to the M103A1. The cost advantages alone argued for a fleet modernization to M60 standards, vice acquiring the M60 series, its completely new 105mm tank cannon and the requisite ammunition. The commandant approved the study on June 5, 1961 and the project was launched that day with an order for two pilot tanks, designated M103A1E1. On November 7 the commandant confirmed his intention with a letter to the Chief of Ordnance requesting modernization of the M103A1 with the "installation of as many M60 components as practicable."

In 1961, the Marine Corps evaluated the Army M60 (far right) as a possible acquisition at Camp Lejeune, North Carolina. The M103A1 and M48A1 tanks served for comparison and the following M51 heavy recovery vehicle served to cover any misfortunes. (USMC)

The program for upgrading the mediums to M48A3 and the similar flame tanks to M67A2 began in December 1962 at the induction rate of 25 and five tanks per month, respectively, while the M103A2 program did not begin until August 1963, at the rate of 25 tanks per month. The refurbished heavies began returning to the Marine Corps from the Army in May 1964.

The M103A2 proved a highly successful upgrade, although the crews would have appreciated in addition the replacement of the electrical amplidyne turret control system with the Cadillac Gage hydraulic system of the M48 and M60 series. But the re-engineering that measure required would have exceeded the economic and interim scope of the project. Thanks to the AVDS-1790-2A diesel engine and the greatly enlarged fuel capacity (from 280 to 440 gallons) of redesigned fuel cells, the former 80-mile range of the tank now stood at a creditable 300 miles. Speed now crept up to 23mph and even trench-crossing improved, thanks to the torque advantage of the diesel. The stereoscopic rangefinder was replaced by the simpler M24 coincidence device, and all optics and range scales were upgraded to metric standards. Some ancillary component upgrades also ensued, but a major improvement came with the installation of the new engine cover and shrouding that allowed the installation of a much more practical deepwater fording kit, which saw considerably more use in the Fleet Marine Force than the earlier version.

The Army modernized Marine Corps tanks to the M103A2 standard at its Anniston Depot, here showing both the M103A2 and the M60 in overhaul. Their rangefinders and automotive components were nearly the same, except that the M103A2 retained the heavier T107 track of the heavy recovery vehicle M51. (US Army)

The Marine Corps Reserve reorganized its units at the end of the Korean War, during which it had functioned largely as a manpower pool. With the organization of the 4th Marine Division USMCR within the reserve establishment in 1963, the requirements changed to support this mobilization organization. While only one battalion of tanks (4th Tank Battalion, USMCR) became necessary for the division, the reserves included additional tank companies as necessary to fill out wartime requirements of the regular FMF. The Corps estimated in 1963 that it needed no fewer than seven companies of M103A2 tanks upon initial mobilization: one per divisional tank battalion and

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Not impressed with the Army M60, the Marine Corps instead chose to dieselize its tank fleet with as many M60 components as feasible. Therefore, yet another pilot vehicle had to be given to the Army, and this M103A1E1 proofed the design for the excellent M103A2, 218 of which were converted starting in 1964. (USMC)

three more for the force tank battalion requirement. In 1967, the 8th Tank Battalion USMCR stood up in the reserve as a force heavy tank battalion with four 120mm tank companies, one meeting the mobilization requirement for the 3rd Tank Battalion on Okinawa. At this point, a peak number of 119 of the 218 M103A2 tanks were therefore allocated to the active and reserve components of the Corps.

For the future, the Marine Corps watched the unfolding MBT70 tank project with interest, as well as progress with the 152mm gun-launcher capable of operating the Shillelagh antitank missile. A turret fitted with the 152mm weapon being developed for the Army M60 fleet would necessarily fit the M48 and M103 series tanks of the Corps. Exiting Vietnam by 1970, the traditional Cold War enemy remained in place and the Corps returned to post-World War II concepts of mobilization and reinforcement of the European theater. The studies and war games conducted at Quantico in the late sixties repeated the 1946 judgment that the current inventory of tanks and antitank weapons no longer sufficed for the NATO mission at any level

F

M103A2, USMC, 1972

Improvements to the operability of the M103A2 also included the conversion of the rangefinder from stereoscopic to coincidence optics. The stereoscopic instrument, while offering certain advantages such as light-gathering, proved awkward as a tank device because so many people lack the ocular powers to make use of the required depth of field sensing. The driver's hatch received the M60 style operating handle, and a new operator's panel for the driver corresponded to the M60.

Unlike the army heavy tank battalion concept of operation, the heavy tank doctrine in the Marine Corps made little distinction for its operation apart from the medium tanks. Fielded as companies in the divisional tank battalion and a force tank battalion that formed only rarely, the M103A1 and A2 tanks were expected to perform in support of the infantry regiments in the same fashion as the medium tanks, when required. Accordingly, they were assigned to field training with the infantry on an approximately equal basis as the tanks of the two medium companies. Thus the heavy tankers trained in tank-infantry tactics, which in any case would have become necessary for the attack on fortifications, a stated heavy tank mission. There was no specific doctrine calling for the support of medium tanks in the field by heavy tank units, and in general it was assumed that the specific situation at hand would determine if the heavy tank company would support an infantry regiment in combat, form as part of the division's antitank plan, or, in the rare case that the tank battalion was used en masse, to operate as part of an armored task force.

The depicted "D24" tank USMC 233060 of 1st Tank Battalion returned to its original 1st Tank Battalion at the end of 1969, presumably taking back its "C24" position in that unit, but would again have become "D24" before it was retired from service. It was painted USMC green lusterless 1620 as camouflage for NATO operations. By 1967, the Marine Corps tank units began to receive the new Xenon-arc 75M candlepower searchlight. Unlike the old Korean War vintage 18-inch incandescent tank searchlight, the new device had potential for the M103A2 tank, for its white light range approached the 2,000-meter range that represented the minimum ideal fighting range of this tank. Although the searchlight boasted a 25M candlepower infrared capability, the M103A2 tanks were never modified with the required IR sights, as their operational service neared its end.

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ABOVE LEFT
Returning the modernized tanks to their battalions was routinely handled using standard tank transporters and heavy flatcars long in service by this point. The consistent opposition of the Army Transportation Corps to the heavy tank in the 1950s had easy equipment solutions in the end. (USMC)

ABOVE RIGHT
The rejuvenated M103A2 showed great improvement in range and even a few numbers of top speed, although getting this tank to speed at Camp Pendleton required much time and a hard, level tank road. This tank served as one of the aggressor vehicles at Exercise Silver Lance. (USMC)

of warfare. By late 1968, the commanding general at Quantico recommended the procurement of the M551 light reconnaissance vehicle, with its powerful 152mm gun-launcher, as a "light armored combat vehicle" (LACV), and the rearming of the M48 tanks with the 105mm gun of the M60 tank, pending the development of the Army's MBT70.

In 1972 the Corps retired the M103A2 and its flame tanks from its active inventory and established the four-company all-medium tank battalion as standard. Hopes ran high that the Army XM803 tank could be purchased and a state-of-the-art tank replace the aging M48. But the failure of this last vestige of the Army MBT70 program threw the Corps into a quandary. The M48, even if upgunned, could not be expected to fare well in the NATO theater. In the end, the standard production army tank had to be acquired after all, and in 1974 the M60A1 replaced all active and reserve tanks of the Marine Corps.

Operating the M103A2

The heavy tank proved fairly popular with the troops, who above all respected the powerful armament it carried. Many challenges to the crewmen, such as the job of the second loader to hand-ram both the projectile and the propellant cartridge into the chamber in a single movement within the confines of a narrow turret, were taken on with a sense of pride. It shared all the teething problems of the M48 series, exacerbated by its unique turret and problems resulting from the extended storage period of the tanks while awaiting successive modification programs.

The ease of operation for the driver remained equal to its lighter medium stable-mate. Although overall weight had crept up to 64 tons with the new engine and increased fuel, the tank climbed the same hills and forded the

Orphaned from 1st Tank Battalion by its deployment to Vietnam, their M103A2s fell in with the wartime activation of 5th Tank Battalion as its D Company. Here they enter Las Flores on May 29, 1967, after a day's work. The unit shields are borrowed directly from the practice of the 1st Battalion. (USMC)

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same streambeds. Once mired, however, it required considerably more effort to extricate. The controls matched the M48 series tanks, and the only discernible weak point remained the front compensating idler arm of the suspension, which tended to overheat and fail more readily in the heat of the California desert on training deployments there. Drivers also learned quickly to watch out for the very long gun tube and anticipate the need to warn the gunner to traverse or elevate it when moving through a ditch or defile.

D Company tanks fire at Range 407 of Camp Pendleton, where careful aiming and ammunition selection were the rule to prevent ricochets from reaching other parts of the base or, some feared, civilian communities. (USMC)

The gunner's controls and devices were more tightly packed than in the medium tank, thanks to the sheer volume of the 120mm gun and the narrow frontal aspect of the turret shape. The electric amplidyne system required a warm-up period and careful balancing of the servos by use of vertical and horizontal potentiometer knobs to prevent drift during engagements. There also existed a unique "gun carry" switch that permitted the gun tube to float against the cushioning of its equilibrator piston, instead of being rigidly held by the turret motors and risking the alignment of the tube as it received the shocks of the tank's cross country ride. In action, the gunner identified the target in his sights, indexing the ammunition called for by the commander in his ballistic computer, and took aim through his non-ballistic periscope sight, applying lead if the target was moving. If the primary system was out of action, he laid the gun directly with his telescope sight using the ballistic reticules for the proper range and ammunition. The real challenge came upon firing, though, as the recoil of the powerful 120mm cannon pulled the tank back on its suspension, in spite of the considerable weight of the vehicle. This rocking uniquely caused the gunner to lose sight of the target upon firing, as the sight picture jumped completely above the target. This effect required the gunner to both reacquire the target and sense the tracer or impact of the round, as the sights and tank rocked back level, to determine any corrections to aim, if necessary.

Late in the service period of the M103 series, these tanks of 2nd Tank Battalion fire at Range G7, Camp Lejeune, sometime in 1970, when Marine Corps battalions added their third medium tank company to their peacetime order of battle. The heavies became D Company and continued to deploy to Guantanamo Bay missions. (USMC)

The two loaders shared the minimal space to the rear of the gunner, the breech of the 120mm gun and among the stowed separate projectiles and propellant casings. The first loader, located behind the gunner, grabbed the ordered projectile (up to 51lb) from its rack and placed it halfway into the open breech of the cannon. The number two loader, standing on the left side of the breech, located and took the long and heavier (up to 57lb) propellant case, ensuring it was the correct one of three types carried for the various rounds, and positioned it horizontally behind the breech, mating its seal to the projectile base, centering over the

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The gunner's position of the M103A2 left little room for comfort, but provided redundant systems for turret control, gunsights, and firing mechanisms. The electrical traversing motors and gearbox are on the right, below the spare periscope sight box. The large articulated direct fire telescope replaced the second coax machine gun of the T43/M103 design, among many later improvements. (Chris Hughes)

exposed tracer element of the round. Now came the moment of truth, for in a single, unbroken and fluid movement of his right arm, he rammed the casing and its joined projectile into the breech, so that it did not separate, and then the casing base tripped the closing of the breechblock. Both loaders remained clear of the breech and the number two pressed the loader safety button, connecting the firing circuit to the gunner (or commander) trigger. An uneven loading movement that caused the projectile to speed up and separate from the front seal of the casing could cause it to jump ahead into the rifling, leaving an air pocket in the chamber space impossible to overcome with the ponderous propellant casing. In the event of such an air lock, the crew had to dismount, engage the rammer staff to the projectile from the gun's muzzle, and knock it out of the rifling back into the turret, and into

G

M103A2 FIRING MAIN GUN FROM DEFENSIVE POSITION ON PERIMETER OF NAVAL BASE, GUANTANAMO BAY, 1970

The heavy tank deployment to the defense of the Navy's enclave base in Cuba perhaps brought the M103 heavy tank nearest to combat. Almost by coincidence it would have faced, at least in theory, an opposing heavy tank of the Russian type. Cuba's army included IS-2 heavies, SU-100 tank destroyers and T-55 mediums, some undoubtedly manned by Russian troops from the brigade they maintained in Cuba in wake of the Cuban Missile Crisis. The Marine Corps heavy tank platoon, augmented by two M67 flame tanks, provided vital tank support to the Guantanamo defense forces from 1963 to 1971, eventually as part of a reinforced infantry battalion deployed on a six-month rotation from the 2nd Marine Division. Apart from defensive drills, the tank platoon manned at night a position of two tanks in revetments overlooking the principal avenue of approach into the base, on the east side.

The action depicted here is a hypothetical fight by one of the two defending tanks of 1st Lieutenant Randy Niewenhous' 1st Platoon, D Company, 2nd Tank Battalion in late 1970 against an early morning attempt at a *coup de main* against the garrison. With starshell illumination, the tanks take out the leading vehicles of the Cuban armored column, while the artillery of Battalion Landing Team 1/8 fires its final protective fires for the position. Already, the lieutenant and his other five tanks are en route to the position and the rest of the 1st Battalion, 8th Marines and the garrison forces execute their defense plan. All of this had been foreseen by LtCol Arthur J. Stuart in 1946.

Tank D13 fires repeatedly with its turret hatch open to discard the empty propellant casings, so large they impede serving the gun if accumulated. The seven stars painted next to the tactical mark are the lieutenant's personal commendations to his crews and he is thus lucky to have this tank in action first.

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To the left of the gunner's position, seen from the forward turret hatch, the large breech mechanism dominates the turret center and shows the equilibrator and its frame. Charged to 1,000 psi, this device not only provided the essential balance of the very long and heavy gun, but also saved much wear and tear of the turret pointing machinery. On the negative side, a failure of the equilibrator seal left the gun inoperable by power or manual means. Note the safety switch on the upper far turret wall, which the second loader must actuate before the gun could be fired. (Author)

the hands of a most distressed number two loader. One of the points of greatest pride for the heavy tankers was the rarity of such an unfortunate event.

The commander, from his throne-like position in the rear of the turret, observed the situation, issued orders, and used his gun controls to lay the gun approximately on the intended target for the gunner's benefit, using the external vane sight on the turret top or just his experienced sensing, then slid down to the rangefinder eyepieces, rotating the range knobs to join the target images into one (coincidence rangefinder). A good commander ranged with the ballistic computer turned on, overcoming the drag of the system linkages on the knob with sensitive but strong hand movements to minimize the time to reach final set-up. If agile enough, he popped up with binoculars to assist the gunner in sensing the round as the tank rocked back. He also had the primary responsibility for keeping the very long gun tube out of harm's way as the tank crossed all kinds of terrain and foliage.

One of the first Marine Corps officers to operate the M103A1 noted:

> One big day was the initial firing of the 120mm guns. It was about Apr59 at the range at the head of Pulgas Canyon [Camp Pendleton]. There were two major concerns... first that the gun/recoil systems worked properly (the tanks had been a long time in storage) and second, that a long round wouldn't wind up in downtown San Clemente (AP was not allowed). We fired HE at about 1,800 yards. The first round from each tank – all 17 – was fired remotely by a hellbox rigged up 20 yards behind each tank ... all hands left the tank and the round was fired from outside. Once all guns were test-fired, we carried out a normal range firing.

A maintenance officer sent to Guantanamo after receiving his training found a surprise awaiting:

Heavy tanks must be properly centered for successful boating, with not much margin for error. Here, the Navy penchant for wood dunnage to save their deck paint (despite the use of rubber track) came to grief when a sudden swell in Guantanamo Bay slipped the tank to one side, and the LCM-8 began to ship water. The floating crane arrived too late and the craft capsized in 30 feet of water. (Siebrand Niewenhous)

> I attended track vehicle maintenance school the summer of '68. Then about two weeks before Thanksgiving, I got orders to relieve the OIC at the Logistic Support Unit in Gitmo. Finally, a deal. Then there were the five M103s they must have been shipped down for the Cuban Missile Crisis. When I went to check their log books, it was clear no PM had been done since they arrived, what, 5 years earlier. One actually made it to our motor pool area under its own power. 9 or 10 of its 12 cylinders actually working.

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The other tanks were like stationary pill boxes, although they were supposed to be tanks, not pill boxes.

Anyhow, we couldn't figure the turret out. Two of these vehicles had badly malfunctioning equilibrator assemblies. The guns pointed generally down. Lord knows what would have happened if they were fired. Then there was the amplidyne system for turret slew and gun elevation, ha. We had no experience in this department whatsoever and needed to call home for help. That's where SSgt Bodie came in, with his photographic memory. Truly remarkable. But no experience with these systems. He could just recall the manuals when asked, reciting verbatim. Anyhow, I went back to Camp Lejeune, saw the division ordnance officer and explained all the other stuff that was falling apart and for which we had no manuals, test equipment, nitrogen cans, or experience. So, about a week later a 10-man contact team was dispatched to Gitmo with instructions to return to CONUS when things worked and not before.

OTHER VARIANTS IN SERVICE

Although the Army experimented with various offshoots of the T43 tank concept, with different turrets, armament, or a lighter weight version, none of these continued after the M103 was made type standard. These included projects for T57, T58, and T110 heavy tanks, all terminated by January 1957.

However, the reservations expressed by the Army Transportation Corps over the difficulties of transporting the tank by rail or road had its own tactical equivalent with the field forces. At the end of WWII, the standard tank recovery vehicles still in service all stemmed from the early M3 and M4 medium tanks. Many of these were declared obsolete postwar, but newer vehicles in the medium recovery vehicle category provided by the Army in the 1950s turned out to be rebuilt vehicles on the same M4 medium chassis, designated M74.

With the T43 heavy tank already planned with a 60-ton combat weight, a heavy tank recovery vehicle became an obvious requirement. Army Field Forces published its requirement on September 8, 1950 for the heavy recovery vehicle T51. By 1953, the Army had determined the need for a new medium recovery vehicle and designated the T51 project solely for heavy tank support, while the Marine Corps desired the T51 to support both medium and heavy

The wisdom of choosing an 85-inch turret ring paid off for both M103 and the later M48 for upgrades. This T58 heavy tank was one of two backups to the T43 program: T57 with an autoloading 120mm and T58 with an autoloading 155mm, both using the new look oscillating turret fad. Both used the M103 chassis and were cancelled when the M103 became type standard. (US Army)

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The M51 heavy tank recovery vehicle, based upon the M103 suspension system, was proposed by the Army for both heavy and medium tank support, but only the Marine Corps took it as such, operating it through 1978 despite dismal logistic support in its elderly years, especially when the Army had embraced the M88 series medium recovery vehicle. (Steven Zaloga)

By 1974, all the Marine Corps M103A2s had reunited at the two depots at Albany, Georgia, and as shown here at the Yermo Annex, Barstow, California. Today, a few dozen M103 series tanks can be found at museums, bases, and private parks and collections, one of these outside the US at Bovington Camp, England. They remain testimonial to the peak automotive technology of 1950 and the aspirations and fears of their intended users. (USMC)

tanks as before. Aberdeen Proving Ground tested two pilot T51s in early 1953 and made several modifications on site. Accordingly, the vehicle was released for production with the stated modifications on September 1, 1953, and was classified type standard on October 8. Chrysler Motors built a total of 187 M51s during 1954–55 at Detroit Tank Arsenal. The Marine Corps took initial delivery of 104 recovery vehicles in July 1956. Deficiencies discovered after production were handled by means of modification kits, and the last vehicle was brought to standard in July 1958. The Army made very limited use of its vehicles, with a single heavy tank battalion in service for a few years in Germany. However, the Marine Corps operated the M51 as its sole tank recovery vehicle from 1959 until 1979, supporting its M48, M103, and M60 series vehicles in the field and at depots and garrison maintenance facilities.

Although it never received modification to diesel power, the M51 proved highly successful as the first U.S. tank-recovery vehicle manufactured from the outset. Weighing 60 tons and using the suspension system of the M103 tank, the M51's greater internal volume permitted the installation of a fully supercharged, fuel-injected version of the Continental 12-cylinder engine. Called the AVSI-1790-6, it developed 1,000 horsepower and required a special XT-1400-2 transmission to handle the power and loading. With its 30-ton crane and 45-ton main and 5-ton auxiliary winches, it displayed great versatility and performed excellent service, although not well supported by the Marine Corps supply services in the field.

CONCLUSION

The M103 series heavy tank reflected the design trends of the post-World War II Army and evolved under the Ordnance Corps development organizations to satisfy the known requirements of Army and Marine Corps users. Although the least developed of the Army programs for light, medium and heavy tanks in progress at the time, the Korean War caused its premature rush to production amid serious concerns for national security that far exceeded the immediate needs of that limited war.

After 1951, the Marine Corps alone retained confidence in the heavy tank program, investing its scarce funds in the improvements necessary to bring about its fielding from that hurried production run. Without the

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Marine Corps' determination to bring the M103 to effective operational status, it seems clear that the 300 vehicles would have languished mostly in storage before eventual disposal. The correctness of the Marine Corps support of the M103 tank was in no small way acknowledged by the Army's borrowing of the 72 M103A1 tanks necessary for its deterrence mission in Germany. No other weapon system, before the era of antitank missiles, could guarantee the destruction of the Russian heavies, which continued their service through the late 1960s. The eventual retirement of the vehicle in 1972, 20 years after manufacture and after 14 years of operational USMC service, demonstrated the soundness of its engineering and fulfillment of its designed role. It may have been the unwanted "ugly duckling" of the Army, which refrained from naming the M103 alone of all its postwar tanks. For the Marine Corps, it served the purpose that it defined for a heavy tank in 1949 until the automotive and weapons technology of the United States could produce viable alternatives.

The useful service that this tank rendered suggests that the heavy tank of the 1950s served as the true precursor to the equally heavy tanks of today's third and fourth generation. The characteristics of the M103 design encompassed the maximum obtainable firepower, armor protection, and mobility that the automotive and ordnance technology of the day permitted. The tanks of today, such as M1A1 Abrams, Challenger II, and Leopard II show these characteristics with the added advantage of technological advances in ordnance, protection systems, and automotive power that the US heavy tankers of 1958 only could have considered in their dreams.

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By 1974, all the Marine Corps M103A2s had reunited at the two depots at Albany, Georgia, and as shown here at the Yermo Annex, Barstow, California. Today, a few dozen M103 series tanks can be found at museums, bases, and private parks and collections, one of these outside the US at Bovington Camp, England. They remain testimonial to the peak automotive technology of 1950 and the aspirations and fears of their intended users. (USMC)

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